

**CLAIMS****WHAT IS CLAIMED IS:**

1. Length Adjustable Gas Spring characterized by the following composition;  
cylinder shaped outer drum (120); spindle support(130) that is comprised at the lower part  
5 of the above mentioned outer drum(120)'s inner part; slide supplementary material(140)  
that is comprised by being injected at the upper part of the above mentioned outer  
drum(120)'s inner side; cylinder(30) of single cylinder structure that is supported through  
the above mentioned slide supplementary material(140) after being inserted to the above  
mentioned outer drum(120); push support (50) comprised at the upper part of the above  
10 mentioned cylinder(30)'s inner side; push bar (40) of synthetic resin material that is  
comprised after being projected towards the outer side of the above mentioned  
cylinder(30) after being inserted into the above mentioned push support (50); valve  
seal(60) of rubber material and elastic entity that is comprised at the lower part of the  
above mentioned push support (50); piston(80,80',80'') of rubber material and elastic  
15 entity that is comprised at the center of the above mentioned cylinder(30)'s inner side; rod  
seal(110) of rubber and elastic entity material that is comprised at the lower part of the  
above mentioned cylinder(30)'s inner side; rod guide(100) of synthetic resin material that  
is comprised at the upper part of the above mentioned rod seal(110); retainer(150) that is  
comprised at the upper part of the above mentioned spindle support(130); vibration-proof  
20 rubber(170) that mitigates the shock of cylinder(30) that moves up and down after being  
comprised at the upper part of the above mentioned retainer(150); piston rod(90,90') that  
is fixated onto the lower part of the above mentioned spindle support(130) by clip(160)  
and that passes through the above mentioned rod guide(100) and rod seal(110) by being

conjoined onto the above mentioned piston(80,80',80"); and pipe for gas transport (70,70',70",70\*) of synthetic resin or metallic material that is inserted to the push bar (40) by passing through the piston(80,80',80"), valve seal(60) and push support (50) that are comprised at the center and upper part of the above mentioned cylinder(30)'s inner side.

- 5 2. When it relates to Claim 1, length adjustable gas spring that is characterized by the following; the above mentioned cylinder(30) is comprised of pass-through hole at the upper and lower part(36,37) that is formed at the upper and lower part; end part of the upper side (32) that is formed to bend towards the inner side and that is formed at the end part of the upper side; sloped side (31) that is conjoined with chair's upper board by being
  - 10 formed in a way that it is sloped at the lower part of the above mentioned end part of the upper side (32); cylinder surface (38) formed at the lower part of the above mentioned sloped side (31); end part of the lower side (33) that is formed to suit curling work by being formed smaller than the measurement of outer diameter of the cylinder surface (38) and that is formed at the lower part of the above mentioned cylinder surface (38);
    - 15 boundary side(34) that is formed between the above mentioned inner side (35-1) of the end part of the above mentioned lower side and inner side of cylinder (35) as slightly projected upward projection in the form of a slope and that is set larger than the inner diameter of cylinder's inner side (35) when it comes to the inner side (35-1) of the end part of the above mentioned lower side, and sloped side (39) that bends into rectangular to
      - 20 prevent separation after injecting the above mentioned components and that facilitates the injection of the above mentioned push support (50), valve seal(60), piston(80,80',80"), and rod guide(100) and rod seal(110) by being injected at the lowest part

Metallic core material outer side of circumference(112) of rod seal(110) is

injected and tightened in the boundary side (34) formed as slightly projected upward projection in the shape of a slope. Movement of rod seal(110) towards the inner side of the cylinder(30) is prevented due to the pressure of gas that is injected at the inside of the cylinder(30).

5 3. When it relates to Claim 1, length adjustable gas spring is characterized by; the above mentioned push bar (40) is in the shape of a rod, and it formed with pass-through hole (47) formed at the center part; central groove (46) where the above mentioned pipe for gas transport(60)'s end part of the upper part is inserted and that is formed at the lower part of the above mentioned pass-through hole (47); and rectangular gap surface(42)  
10 formed between small diameter surface (41) of the outer side and large diameter side(43) to prevent the separation from the push support (50).

4. When it relates to Claim 1, length adjustable gas spring is characterized by; push support(50) is included at the upper part of the cylinder(30)'s inner side. It is formed in the center in the shape of a cylinder, and is comprised of; pass-through hole (51) for  
15 injecting the above mentioned push bar (40), suspension sill(53) that is formed around the upper part of the above mentioned pass-through hole (51) and that prevents the separation of the above mentioned push bar (40); and insertion part(52) that is formed at the lower part to conjoin with valve seal(60).

5. When it relates to Claim 1, length adjustable gas spring is characterized by; the  
20 above mentioned valve seal(60) is dynamic pressure seal of the ring shape that is formed with pass-through hole (67) formed at the center; seal lip(61,62) formed three to five each at the outer side of circumference and inner side of circumference; space side (66) that is formed between the above mentioned outer side of circumference and inner side of

circumference seal lip(61,62) into side (63), side(64) and side(65)'s mutually rectangular shape and where the insertion part(52) of the above mentioned push support (50) is inserted by being attached closely; space side (68) that has surface of sloped part (69) in order to increase sealing ability due to gas pressure at the inside of the above mentioned cylinder(30) and that is formed at the lower side between the above mentioned seal lip(61,62).

Numerous seal lips(62) at the inner side of circumference increases endurance and that minimizes the friction at the time of movement and gyration of pipe for gas transport(70) between the pass-through hole (67) that is formed at the inner side of circumference.

Gas sealing ability is increased since numerous seal lips (61) of the above mentioned outer side of circumference is closely attached to the inner side of the cylinder(30).

6. When it relates to Claim 1, length adjustable gas spring characterized by; the above mentioned pipe for gas transport(70) is cylinder pipe that is formed into straight line or curved line, and it is comprised of passageway for gas transport(73) that is formed at the center of the inside, end part(71) that is comprised at the end part of the upper part in the form of tightened side; gas transport hole(72) that is formed at the side of the lower part of the end part (71); end part of the lower side(64) that prevents separation when injected into the piston (80) by being formed into the shape of a horn towards the outer side of the end part of the lower side; and metallic bar(79) that is composed by injecting into the interior.

7. When it relates to Claim 1, length adjustable gas spring is characterized by; end

part of the upper part(71') formed at the end part of the upper part when it relates to the above mentioned pipe for gas transport(70'); passageway for gas transport(73') formed at the center of the inside; gas transport hole(72') that is formed at the side of the lower part of the above mentioned end part of the upper part(71'); collection of round shaped spring type of pipe (R') formed at the lower part of the above mentioned gas transport hole(72');  
 5 metallic bar(79'-1,79'-2) that is formed from the one side of collection of spring type of pipe round shape(R\*)'s lower part to the end part of the lower part and from the lower part of the above mentioned end part of the upper part(71') to the one side of the above mentioned collection of round shaped spring type of pipe(R')'s upper part in order to  
 10 prevent the twisting and transmutation of the above mentioned collection of spring type of pipe round shape(R'); and end part of the lower side(74') formed with horn shaped open side at the end part of the lower part to prevent the separation from the above mentioned piston(80").

8. When it relates to Claim 1, length adjustable gas spring is characterized by; the  
 15 above mentioned pipe for gas transport(70") forms end part of the upper part(71"); passageway for gas transport(73") that is formed at the center of the inside; push pin(78") that is included at the upper part of the above mentioned passageway for gas transport(73"); gas sealing hole(76",77") of hole shape that is formed at the end part of the lower side and the center of the above mentioned push pin(78"); projected part(78"-  
 20 1,78\*-2) for the prevention of separation that prevents the separation of the gas sealing hole(76",77") by being formed at the center of the above mentioned push pin(78") and end part of the lower side; gas transport hole(72") that is formed between the above mentioned gas sealing holes(76",77"); swelled oval spherical surface(75") of oval hole

shape that is formed below the above mentioned gas transport hole(72''); end part of the lower side(74'') where horn shaped open side is formed at the end part of the lower part to prevent separation from the above mentioned piston(80''); and metallic bar(79'') that prevents transmutation by being formed up to the area near the end part of the lower side(74'') from the lower part of the above mentioned swelled oval spherical surface(75'').

9. When it relates to Claim 1, length adjustable gas spring characterized by; the above mentioned pipe for gas transport(70\*) forms end part of the upper part(71\*); passageway for gas transport(73\*) that is formed at the center of the inside; push pin(78\*) that is included at the upper part of the above mentioned passageway for gas transport(73\*); gas sealing hole(76\*,77\*) of hole shape that is formed at the end part of the lower side and the center of the above mentioned push pin(78\*); projected part(78\*-1,78\*-2) for the prevention of separation that prevents the separation of the gas sealing hole(76'',77'') by being formed at the center of the above mentioned push pin(78\*) and end part of the lower side; gas transport hole(72\*) that is formed between the above mentioned gas sealing holes(76\*,77\*); swelled oval spherical surface(75\*) of oval hole shape that is formed below the above mentioned gas transport hole(72\*); end part of the lower side(74'') where horn shaped open side is formed at the end part of the lower part to prevent separation from the above mentioned piston(80''); and metallic bar(79'') that prevents transmutation by being formed up to the area near the end part of the lower side(74'') from the lower part of the above mentioned swelled oval spherical surface(75'').

10. When it relates to Claim 1, length adjustable gas spring characterized by; inner diameter part(82) that is formed at the center and that is riveted by being inserted with the

upper part of the above mentioned piston rod(90); projected part(89) that is formed to project out towards the upper and lower side at the end part of both sides of the above mentioned inner diameter part(82); metallic core material(87) that is formed at the center; radial type of double seal lip(81,81-1) that is formed by being projected out onto the outer side of circumference by forming an acute angle with side (88) of the above mentioned metallic core material(87); hole (86) where the above mentioned pipe for gas transport(70) goes through by being formed between the outer side of circumference and inner diameter part(82) formed with the above mentioned radial type of double seal lip(81,81-1), and double seal lip(84,84-1) for the sealing of gas between the pipe for gas transport(70) and hole(86) by being formed in the same structure and shape as that of double seal lip(81,81-1) of the above mentioned outer side of circumference into the inner side radial type of direction at the inside of the above mentioned hole(86).

Double seal lip(81,84) of the upper side plays the main role of sealing gas if and when the gas pressure in the Y chamber room (Y) is higher than that of the X chamber room(X). On the contrary, double seal lip(81-1,84-1) of the lower side plays the main role of sealing gas if and when the gas pressure of the Y chamber room (Y) is lower than that of the X chamber room(X).

11. When it relates to Claim 1, the above mentioned piston (80) as it relates to the length adjustable gas spring is characterized by; groove (83') inserted with O-ring (81') that is comprised of elastic entity that tightens gas by being formed at the outer side of circumference of the upper part; groove (82') that is formed in a way that the piston rod(90) is fixed based on the insertion of end part of the upper part(91) that is formed by riveting piston rod surface of upper part(92) of the small diameter of the piston rod(90) by

being formed to approximately to 7/10 point of the piston's diameter from the side of the lower part; hole (86') where the above mentioned pipe for gas transport(70\*) penetrates by being formed between the above mentioned groove (82') and outer side of circumference; and groove (83'-1) that is inserted with the O-ring (84') that is made of elastic entity at the inside of the hole (86') for the sealing of gas between the above mentioned pipe for gas transport (70\*) and hole (86').

12. When it relates to Claim 1, length adjustable gas spring characterized by;

the above mentioned piston(80'') depicts length adjustable gas spring that forms hole (86') where the above mentioned pipe for gas transport(70\*) or pipe for gas transport(70'') penetrates through;; and groove (82') that is formed in a way that the piston rod(90) is fixed based on the insertion of end part of the upper part(91) that is formed by riveting piston rod surface of upper part(92) of the small diameter of the piston rod(90) by being formed to approximately to 8/10 point of the piston's diameter from the side of the lower part.

15 groove (83'') inserted with O-ring (81'') that is comprised of elastic entity that tightens gas by being formed at the outer side of circumference of the upper part; hole (86'') where the above mentioned pipe for gas transport(70') or pipe for gas transport(70'') penetrates through; groove (83'-1) that is inserted with the O-ring (84'') that is made of elastic entity at the inside of the hole (86'') for the sealing of gas between the above mentioned pipe for gas transport (70') or pipe for gas transport(70'') and hole (86'); 20 groove (85'') that is formed up to the 8/10 point of the piston's diameter from the side of the lower part and that is inserted and fixes the above mentioned piston rod(90')'s radial type of end part of the upper part(91'); and the gas transport groove(87'') that is formed



with gas transport groove(87") that is formed at the center part of the upper part of the above mentioned groove (85") to move between X chamber room(X) and piston rod(90').

13. When it relates to Claim 1, length adjustable gas spring when it relates to the above mentioned piston rod(90') is characterized by; surface of upper part(92) that is fixated into round shaped fixation board(91) by being input into the inner diameter part(82) of the above mentioned piston(80) by being formed at the upper part; surface of lower part(96) that is formed to enable the above mentioned retainer(150) and spindle support(130) to be inserted and that is formed at the lower part; surface of the middle part(95) that is input into the above mentioned rod guide(100), rod seal(110), cylinder(30)'s pass-through hole at the lower part (37) and vibration-proof rubber(170) and that is formed between the above mentioned surface of upper part(92) and surface of lower part(96); boundary side (93,94) in which the boundary part of the above mentioned upper, and surface of lower part(92,96) and surface of the middle part(95) are each comprised of rectangular gap; groove (97) that is formed so that the above mentioned clip(160) can be inserted and that is formed at the lower par of the above mentioned surface of lower part(96).

14. When it relates to Claim 1, length adjustable gas spring when it relates to the above mentioned piston rod(90') is characterized by; end part of the upper part(91') that is projected in the form of radial that is inserted into the groove (85") at the side of the piston(80")'s lower part by being formed on the above mentioned piston rod(90') is comprised of upper piston rod(90') is comprised of upper part; part of lower side (94') that is bent towards the inner side in the form of radial at the lower part; inner groove (92') that is formed at the inside of the center and where gas sealing elastic entity(98') and

rod for lower side conjoining(93') are inserted; and piston rod surface (95') that assumes large diameter part that moves two-way by contacting with the inner side of circumference seal lip(114) of the rod seal(110) by being formed between the above mentioned end part of the upper part(91') and part of lower side(94').

5           Length Adjustable Gas Spring that forms conjoining projection(99') for the prevention of separation by being fixated onto the above mentioned part of lower side (94') when it comes to the upper part of rod for lower side conjoining(93') that is inserted and conjoined with the above mentioned inner groove (92'); side of small diameter part(96') that is inserted into vibration-proof rubber(170), retainer(150) and spindle  
10 support(130) by being formed at the lower part of the above mentioned conjoining projection; and groove (97') where the clip (160) is inserted by being formed at the lower part of the above mentioned side of small diameter part(96').

15           When it relates to Claim 1, length adjustable gas spring characterized by; the above mentioned rod guide(100) is formed with inner side of circumference(101) of the cylinder shape that is formed inside the upper side; and center hole (105) that goes  
through the piston rod (90) that is formed at the center part.

16.       When it relates to Claim 1, length adjustable gas spring characterized by; the above mentioned rod seal(110) is comprised of; center hole(115) that is formed at the center; seal lip(113,114) that increases the ability to tighten gas by minimizing friction  
20 ability and that is configured into 3 to 5 layers at the outer side of circumference and inner side of circumference; groove (116) that is formed between the above mentioned seal lip(113,114); and metallic core material (111) that is composed in a way that the outer side of circumference(112) cannot move to the inner direction of the cylinder by the

slightly projected upward projection boundary side(34) of the above mentioned cylinder(30) at the time of injecting high pressure gas by maintaining round shape under the high gas pressure by being included at the floor, making the outer diameter of the outer side of circumference(112) is made similar to the inner diameter of the inner side of the lower part's end part when it comes to the cylinder(30), and making it larger than the inner side of cylinder (35).

17. When it relates to Claim 1, length adjustable gas spring characterized by; slide supplementary material(140) made of synthetic resin is injected in the upper part of the inner side when it comes to the outer drum(120). After its composition, at least one projection (121) is included at the inner side of the upper part to prevent separation. Moreover, at least two projections (123) was formed towards the inner direction at the tapered end part of the lower side part so that it will be symmetrical, both on the left and right side. At least two projections (122) are formed upward from the above mentioned projection (123). And spindle support (130) is placed and fixated between the above mentioned projections (122,123) without welding.

18. When it relates to Claim 1, the above mentioned spindle support (130) as it relates to the length adjustable gas spring is characterized by; surface of the center part (134) of the rounded board; sloped part(131) that is formed to slope to specific angle towards the outer side of the above mentioned surface of the center part (134); and hole (132) where the lower part of the piston rod(90) that is at the center of the above mentioned surface of the center part (134) penetrates through to support weight of least 250Kg.

19. When it relates to the operation method of the length adjustable gas spring, if and

when the push bar (40) is pressed with force at a state when the gas is inside the cylinder (30) with fixed pressure, pipe for gas transport(70) moves towards the "A" direction. Gas transport hole(72') that is at the upper side of the pipe for gas transport(70, 70') moves to the Y chamber room (Y) from the center of the valve seal(60)'s inner side of circumference(62). Gas in the X chamber room(X) moves to the Y chamber room (Y) through passageway for gas transport(73, 73') and gas transport hole(72, 72'). Accordingly, piston rod(90, 90'') moves to the "A" direction, and cylinder(30) increases towards the "B" direction due to opposing reaction since piston rod(90, 90'') is fixed onto the spindle support(130) that is inserted onto the outer drum(120) by the clip(160).

Moreover, if and when the external force that presses down on the push bar (40) is removed, pipe for gas transport(70, 70') moves to the "B" direction by leveraging its own force due to the pressure of the gas of the X chamber room(X) at the inside of cylinder(30). Accordingly, gas transport hole(72, 72') of pipe for gas transport(70, 70') moves to the center hole(67) at the inside of the valve seal(60). Since the pass-through hole of the gas transport hole(72, 72') is tightened, movement of gas between X chamber room(X) and Y chamber room (Y) stops, and the piston rod(90, 90'') stops to move. Accordingly, cylinder(30) stops to increase to the "B" direction.

20. When it relates to the operation method of the length adjustable gas spring, if and when the push pin(78'', 78\*) is pressed with the force at a state when the gas is inside the cylinder (30) with fixed pressure, gas sealing hole (77'') at the lower part of the push pin(78'', 78\*) moves towards the "A" direction, and is situated at the center part of the inside of swelled oval spherical surface(75'', 75\*) of pipe for gas transport(70'', 70\*) to penetrate through. Accordingly, gas of the X chamber room(X) moves from the X

chamber room(X) to Y chamber room (Y) through passageway for gas transport(73", 73\*) and gas transport hole(72", 72\*). Piston rod(90, 90') moves to the "A" direction, and cylinder(30) increases towards the "B" direction due to opposing reaction since piston rod(90, 90') is fixed onto the spindle support(130) that is inserted onto the outer  
5 drum(120) by the clip(160).

Moreover, if and when the external force that presses the push pin(78", 78\*) is removed, gas sealing hole(77", 77\*) at the lower part of the push pin(78", 78\*) moves towards the "B" direction at the upper part of the swelled oval spherical surface(75\*) due to the pressure of the gas of the X chamber room(X) that is at the inside of cylinder (30).  
10 As such, passing through of pipe for gas transport(70", 70\*)'s passageway for gas transport (73", 73\*) is blocked, which in turn stops the transportation of gas between X chamber room(X) and Y chamber room (Y). As a result, piston rod(90, 90') stops to move and cylinder(30) stops increase into the "B" direction.